

CLAIMS

What is claimed is:

1. An image forming apparatus having a developing roller mounted to be spaced with a photo-sensitive body and supplying a developing agent to the photo-sensitive body, and a bias-applying part applying a predetermined bias to the developing roller through a current-conducting path to the photo-sensitive body from the developing roller, further comprising:

a current detection part detecting a developing current flowing through the developing roller in response to the bias applied from the bias-applying part and generating a current value; and

an engine control part controlling the bias-applying part to supply a first test AC voltage having a set first frequency to the developing rollers and supply a second test AC voltage having a set second frequency to the developing roller, calculating a resistance of the developing roller and a developing gap between the developing roller and the photo-sensitive body in accordance with the current value detected from the current detection part respectively corresponding to the first and second AC voltages having the corresponding first and second frequencies, and controlling the bias-applying part to supply the developing roller with a bias voltage of a driving condition corresponding to the calculated resistance of the developing roller and the calculated developing gap.

2. A method of controlling an image forming apparatus having a developing roller mounted to be spaced with a photo-sensitive body and supplying a developing agent to the photo-sensitive body, and a bias-applying part applying a predetermined bias to the developing roller through a current-conducting path to the photo-sensitive body from the developing roller, the method comprising:

supplying a first test AC voltage having a set first frequency to the developing roller;

detecting a first developing current flowing through the developing roller corresponding to the first test AC voltage having the first frequency;

applying a second test AC voltage having a set second frequency to the developing roller;

detecting a second developing current flowing through the developing roller corresponding to the second test AC voltage having the second frequency;

calculating a resistance of the developing roller and a developing gap between the developing roller and the photo-sensitive body using data of the first and second test AC

voltages and data of the first and second developing currents detected in response to the respective first and second test AC voltages; and

supplying the developing roller with a bias voltage of a driving condition corresponding to the calculated resistance of the developing roller and the calculated developing gap.

3. An image forming apparatus having a developing mounted to be spaced with a photo-sensitive body and supplying a developing agent to the photo-sensitive body, and a bias-applying part applying a predetermined bias to the developing roller through a current-conducting path to the photo-sensitive body from the developing roller, comprising:

a current detection part detecting a developing current flowing through the developing roller in response to the bias supplied by the bias-applying part; and

an engine control part controlling the bias-applying part to supply a set test AC voltage to the developing roller, calculating a resistance of the developing roller and a developing gap between the developing roller and the photo-sensitive body using information on a phase difference between the developing current outputted from the current detection part and the AC voltage, and controlling the bias-applying part to supply the developing roller with a bias of a driving condition corresponding to the calculated resistance of the developing rollers and the calculated developing gap.

4. A method of controlling an image forming apparatus having a developing roller mounted to be spaced with a photo-sensitive body and supplying a developing agent to the photo-sensitive body, a bias-applying part applying a predetermined bias to the developing roller through a current-conducting path to the photo-sensitive body from the developing roller, the method comprising:

applying a set test AC voltage to the developing roller;

detecting a developing current flowing through the developing roller in response to the test AC voltage;

calculating a resistance of the developing roller and a developing gap between the developing roller and the photo-sensitive body using information on a phase difference between the test AC voltage and the developing current; and

supplying the developing roller with a bias of a driving condition corresponding to the calculated resistance of the developing rollers and the calculated developing gap.

5. An image forming apparatus having a developing roller mounted to be spaced

with a photo-sensitive body and supplying a developing agent to the photo-sensitive body, and a bias-applying part applying a predetermined bias to the developing roller through a current-conducting path to the photo-sensitive body from the developing roller, comprising:

a current detection part detecting a current flowing through the developing roller in response to the bias by the bias-applying part, and detecting first and second developing current values of the current corresponding to first and second time periods after a reference time at which a current peak value of the current occurs, respectively; and

an engine control part controlling the bias-applying part to supply a set test AC voltage to the developing roller as the bias, calculating a resistance of the developing roller and a developing gap between the developing roller and the photo-sensitive body by analyzing data of the current and the first and second developing current values, and controlling the bias-applying part to supply the developing roller with a bias of a driving condition in accordance with the calculated resistance of the developing rollers and the calculated developing gap.

6. A method of controlling an image forming apparatus having a developing roller mounted to be spaced with a photo-sensitive body and supplying a developing agent to the photo-sensitive body, and a bias-applying part supplying a predetermined bias to the developing roller through a current-conducting path to the photo-sensitive body from the developing roller, the method comprising:

supplying a set test AC voltage to the developing roller using the bias-applying part; storing time data of a developing current flowing through the developing roller in response to the set test AC voltage;

detecting first and second developing current values corresponding to respective first and second time periods after a reference time at which a peak value of the current occurs in response to the test AC voltage;

calculating a resistance of the developing roller and a developing gap between the developing roller and the photo-sensitive body according to the first and second developing current values and time data; and

supplying the developing roller with a bias of a driving condition corresponding to the calculated resistance of the developing roller and the calculated developing gap.

7. An image forming apparatus having a developing roller supplying a developing agent to the photo-sensitive body and a bias-applying part applying a predetermined bias to the developing roller through a current-conducting path to the photo-sensitive body from the

developing roller, comprising:

a current detection part detecting a current flowing through the developing roller in response to the bias by the bias-applying part; and

an engine control part controlling the bias-applying part to supply the developing roller with an AC voltage as the bias, calculating a resistance of the developing roller and a developing gap between the developing roller and the photo-sensitive body using the AC voltage and the detected current, and controlling the bias-applying part to supply the developing roller with another bias of a driving condition in accordance with the calculated resistance of the developing roller and the calculated developing gap between the developing roller and the photo-sensitive body.

8. The apparatus of claim 7, wherein the engine control part comprises a lookup table storing developing bias data corresponding to respective resistances of the developing roller and respective developing gaps between the developing roller and the photo-sensitive body, selects one of the stored developing bias data from the lookup table in accordance with the calculated resistance of the developing roller and the calculated developing gap, and controls the bias-applying part to supply the developing roller with the another bias of a driving condition in accordance with the selected one of the stored developing bias data.

9. The apparatus of claim 7, wherein the developing roller supplies the developing agent to the photo-sensitive body through the developing gap, and the engine control part calculates the developing gap from a developing gap capacitance of the developing gap using the AC voltage and the detected current.

10. The apparatus of claim 7, wherein the bias-applying part comprises:

a DC voltage source generating a DC voltage;

an AC voltage source generating the AC voltage superimposed with the DC voltage in response to a control of the engine control part and supplying the AC voltage to the developing roller; and

a resistor having a first end connected between the DC voltage source and the current detection part and a second end connected to a voltage reference.

11. The apparatus of claim 10, wherein the bias applying part comprises a DC voltage source generating a DC voltage and an AC voltage source generating the AC voltage

superimposed with the DC voltage in response to a control of the engine control part and supplying the AC voltage to the developing roller, and the current detection part comprises a current transformer connected to the bias-applying part to detect the current using an induction method.

12. The apparatus of claim 7, further comprising:

a key input part through which a developing condition adjustment mode is generated, wherein the engine control part generates a control signal in response to the developing condition adjustment mode of the key input part, the current detection part detects the current flowing through the developing roller in accordance with the control signal, and the bias-applying part supplies the developing roller with the AC voltage as the bias.

13. The apparatus of claim 7, wherein the engine control part generates a control signal for a developing condition adjustment mode, the current detection part detects the current flowing through the developing roller in accordance with the control signal, and the bias-applying part supplies the developing roller with the AC voltage as the bias.

14. The apparatus of claim 13, wherein the engine control part generates the control signal when a product assembly of the image forming apparatus is finished, when a replacement of parts of the image forming apparatus occurs, when a time period for use of the image forming apparatus expires, or when the number of sheets of paper for a printing job is greater than a set number.

15. The apparatus of claim 7, wherein the AC voltage comprises a first AC voltage having a first frequency and a second AC voltage having a second frequency, and the current comprises a first current and a second current in response to corresponding ones of the first and second AC voltages, respectively.

16. The apparatus of claim 15, wherein the engine control part calculates the resistance of the developing roller and the developing gap between the developing roller and the photo-sensitive body using the first and second AC voltages and the first and second currents.

17. The apparatus of claim 15, wherein the engine control part calculates the

developing gap from a developing gap capacitance using the first and second frequencies.

18. The apparatus of claim 17, wherein the engine control part comprises:

a lookup table having developing bias data corresponding to respective developing gap capacitances, selects one of the developing bias data from the lookup table in accordance with the developing gap capacitance, and controls the bias-applying part to supply the developing roller with the another bias of the driving condition in accordance with the selected one of the developing bias data.

19. The apparatus of claim 17, wherein the engine control part comprises:

a lookup table having developing bias data corresponding to respective resistances of the developing roller, selects one of the developing bias data from the lookup table in accordance with the resistance of the developing roller, and controls the bias-applying part to supply the developing roller with the another bias of the driving condition in accordance with the selected one of the developing bias data.

20. The apparatus of claim 7, wherein the AC voltage comprises a first phase, and the current comprises a second phase.

21. The apparatus of claim 20, wherein the engine control part calculates the resistance of the developing roller and the developing gap between the developing roller and the photo-sensitive body using a difference between the first phase of the AC voltage and the second phase of the current.

22. The apparatus of claim 21, wherein the first phase of the AC voltage is a phase of a maximum value of the AC voltage, and the second phase of the current is a phase of a maximum value of the current during supplying the AC voltage to the developing roller.

23. The apparatus of claim 20, wherein the engine control part comprises:

a lookup table storing developing bias data corresponding to respective resistances of the developing roller and respective developing gaps between the developing roller and the photo-sensitive body, selects one of the stored developing bias data from the lookup table in accordance with the calculated resistance of the developing roller and the calculated developing gap, and controls the bias-applying part to supply the developing roller with the another bias of a

driving condition in accordance with the selected one of the stored developing bias data.

24. The apparatus of claim 7, further comprising:

another developing roller supplying another developing agent to the photo-sensitive body, wherein the engine control part controlling the bias-applying part to supply the another developing roller with the AC voltage, receiving another developing current flowing through the another developing roller in response to the AC voltage supplied by the bias-applying part from the current detection part, calculating another resistance of the another developing roller and another developing gap between the another developing roller and the photo-sensitive body using the AC voltage and the detected another developing current, and controlling the bias-applying part to supply the another developing roller with another bias of the driving condition in accordance with the calculated another resistance of the another developing roller and the calculated another developing gap between the another developing roller and the photo-sensitive body.